

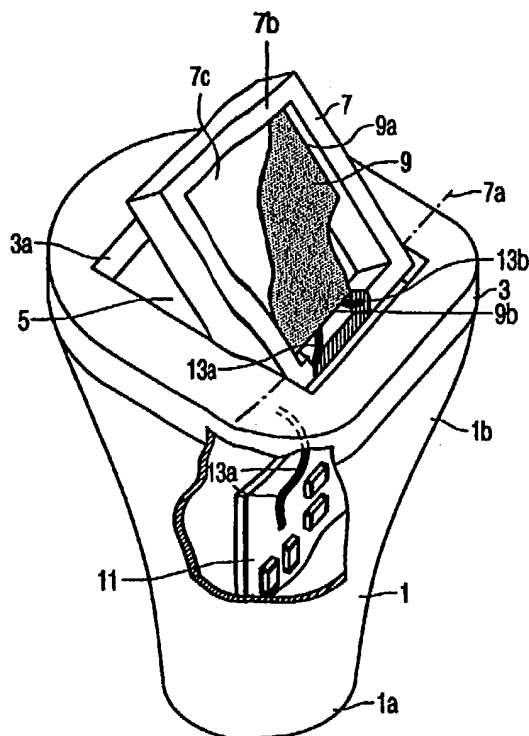
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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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**(54) Title:** A HEARING AID COMPRISING A DETECTOR FOR WIRELESS RECEPTION OF SIGNALS AND A SYSTEM COMPRISING SAID HEARING AID**(57) Abstract**

A hearing aid, in particular an in-the-ear hearing aid, which comprises a very compact housing (1), which accommodates an electronic circuit (11) and a battery compartment (5). A faceplate (3) includes a lid-shaped element (7) which can be moved with respect to the battery compartment, the battery compartment being closed in a closed position of the lid-shaped element, and the battery compartment being accessible in an open position of the lid-shaped element. A detector (9) is secured to the lid-shaped element, which detector is embodied so as to be suitable for the wireless reception of signals and conversion thereof to electrical signals. The hearing aid is provided with an electrical connection means (13a, 13b) which, at least in the closed position of the lid-shaped element, connects the detector to the electronic circuit.



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A HEARING AID COMPRISING A DETECTOR FOR WIRELESS RECEPTION OF SIGNALS AND A SYSTEM COMPRISING SAID HEARING AID

The invention relates to a hearing aid, in particular an in-the-ear hearing aid, comprising a housing and a faceplate, which housing accommodates an electronic circuit and a battery compartment, said faceplate including a lid-shaped element which can be moved with respect to the battery compartment, said battery compartment being closed in a closed position of the lid-shaped element, and said battery compartment being accessible in an open position of the lid-shaped element.

Such a hearing aid is disclosed in EP-A 0 307 697 and is constructed so as to be worn in an auditory canal. For this purpose, the known hearing aid includes a housing which is adapted to the shape of an auditory canal and provided with a relatively narrow proximal end part and an opposed, relatively wide distal end part situated near a plate-shaped faceplate. The housing accommodates, inter alia, components such as a converter for converting an audio signal to an electrical signal, an amplifier and/or a signal processor, and a converter for converting an electrical signal to an acoustic signal. The housing additionally includes a battery compartment for accommodating a battery. The faceplate is provided with a flap, the battery compartment being closed in a closed position of the flap, while in the open position of the flap, the battery compartment is open at the location of the faceplate, thereby enabling a battery to be provided, removed or replaced. The faceplate is further provided with a manually operable volume control knob for adjusting and setting the sound level.

In order to enable a user to use a hearing aid as inconspicuously as possible, there is a sustained effort to obtain ever more compact constructions. The presence of a control knob, such as the volume control knob in the known hearing aid, stands in the way of such a miniaturization because, on the one hand, such a knob must have certain minimum dimensions in order to be usable and, on the other hand, takes up a certain amount of space.

It is an object of the invention to provide a very compact hearing aid, in particular an in-the-ear hearing aid, which can be controlled via a remote control.

To achieve this, the hearing aid in accordance with the invention is characterized in that a detector is secured to the lid-shaped element, which detector is embodied so as to be suitable for the wireless reception of signals and conversion thereof to electrical signals, an electrical connection means being present, which connects, at least in the

closed state of the lid-shaped element, the detector to the electronic circuit. A signal to be received by the detector may originate from a remote control, which can be operated, for example, by the person wearing the hearing aid. Such a signal may serve, for example, to turn a source-selector switch and/or a signal-processing selector switch. It is also possible to use signals received from a remote control to change settings and/or programs stored in the hearing aid. Consequently, manually operable knobs and/or electrical connections on the hearing aid are unnecessary, resulting in additional possibilities of miniaturization. Preferably, at least in the closed position of the lid-shaped element, the detector extends opposite the battery compartment. In the housing itself, the detector secured to the lid-shaped element takes up no space at all, or only a negligible amount of space, which, of course, has a favorable effect on the aim of further reducing the size of the hearing aid.

In an embodiment of the hearing aid in accordance with the invention, the detector comprises an infrared radiation-sensitive semi-conducting element, such as a photodiode or a photoresistor. It is noted that hearing aids provided with an infrared detector for receiving infrared signals are known per se. Furthermore, it is known to arrange a detector in the housing, whereby infrared signals can reach the detector via an opening in the faceplate of the hearing aid.

In a practical embodiment of the hearing aid in accordance with the invention, the above-mentioned semiconducting element has main dimensions which extend at least substantially parallel to a main surface of the lid-shaped element. The semiconducting element, which is situated, entirely or partly, in the lid-shaped element or which engages the lid-shaped element, preferably extends opposite a part of the lid-shaped element which is transparent to the radiation used. This measure enables the housing to be completely closed in the closed position of the lid-shaped element.

In a miniaturized embodiment of the hearing aid in accordance with the invention, the lid-shaped element extends over the major part of the faceplate. Preferably, the faceplate is only slightly larger than the lid-shaped element itself.

A practical embodiment of the hearing aid in accordance with the invention is characterized in that the lid-shaped element is secured so as to be pivotable relatively to the housing. Therefore, in this embodiment, the lid-shaped element is embodied so as to be flap-shaped. In this connection, it is advantageous to use a flexible hinge with an integral electric conductor which forms part of the electrical connection means. Such a hinge enables, on the one hand, the lid-shaped element to be pivoted to the housing and, on the other hand, a reliable

electric connection to be made between the detector and the electronic circuit present in the housing.

A readily realizable embodiment of the hearing aid in accordance with the invention is characterized by the measures as defined in claim 9.

5           The invention further relates to a system which includes the hearing aid in accordance with the invention and a remote control adapted to said hearing aid. A signal transmitted by the remote control is received, during operation of the hearing aid, by the detector of said hearing aid. Such a signal may serve, for example, to turn a source-selector switch and/or a signal-processing selector switch, or to change settings and/or programs stored  
10 in the hearing aid. The remote control is preferably embodied so as to be an infrared remote control for transmitting infrared signals. In this case, the hearing aid is preferably provided with an infrared radiation-sensitive semiconducting element as the detector.

          These and other aspects of the invention are apparent from and will be elucidated by way of non-limitative example, with reference to the embodiments described  
15 hereinafter.

In the drawings:

Fig. 1 diagrammatically shows, mainly in perspective, a first embodiment of the hearing aid in accordance with the invention,

20           Fig. 2A diagrammatically shows, partly in side view and partly in section, the first embodiment,

Fig. 2B diagrammatically shows an embodiment of a remote control which can suitably co-operate with the first embodiment of the hearing aid in accordance with the invention, and

25           Figs. 3, 4 and 5 diagrammatically show, mainly in perspective, parts of, respectively, a second, third and fourth embodiment of the hearing aid in accordance with the invention.

          The in-the-ear hearing aid shown in Figs. 1 and 2A comprises a compact housing 1 having a relatively narrow proximal end part 1a, which is adapted to a human  
30 auditory canal, and, contiguous therewith, a relatively wide distal end part 1b. The end part 1b terminates at a plate-shaped faceplate 3 and is provided with a battery compartment 5 for a battery 5a. The faceplate 3 is provided with a relatively large aperture 3a wherein a lid-shaped element 7 is arranged which is pivotable about a pivot axis 7a by means of hinges, which are not shown in the drawing.

In the situation shown in Fig. 1, the lid-shaped element 7 is in an open position, in which the battery compartment 5 is accessible. In the situation shown in Fig. 2A, the element 7 is in the closed position, in which the compartment 5 is closed. A detector 9 including an infrared radiation-sensitive semiconducting element is secured in the element 5, said detector being only partly shown in the drawing.

The detector 9 extends over the major part of the faceplate 3 and has main dimensions 9a, 9b which extend parallel to a main surface of the lid-shaped element 7, such as the outer surface 7b. In this example, the detector 9 is situated, viewed from the outer surface 7b, under an infrared radiation-transparent plate-shaped part 7c of the lid-shaped element 7 and is in the closed position of the element 7, opposite the battery compartment 5. The detector 9 used is embodied so as to be suitable for the reception of infrared signals and conversion thereof to electrical signals. The housing 1 accommodates an electronic circuit 11 including, for example, a signal processor for deriving a control signal from the detected signals. The housing 1 further accommodates, as is assumed to be known, components such as a microphone, a loudspeaker and an amplifier unit which forms part of the electronic circuit 11 and is arranged between the microphone and the loudspeaker.

The detector 9 is connected to the electronic circuit 11 by means of an electrical connection means which, in this example, is formed by two electric conductors 13a, 13b.

The remote control shown in Fig. 2B comprises an infrared transmitter 15 for transmitting infrared signals, which can be detected by the detector 9 of the hearing aid in accordance with the invention as shown in Figs. 1 and 2A. The remote control, which is known per se, is further provided with control buttons and/or knobs 17.

In the following description of further embodiments of the hearing aid in accordance with the invention, construction elements which correspond to construction elements in the first embodiment will be indicated by the same reference numerals.

The hearing aid shown in Fig. 3 comprises a housing 1 and a faceplate 3. Said housing 1 accommodates electronic means and a battery compartment 5. The faceplate 3 includes a lid-shaped element 7 which can be moved with respect to the compartment 5. A detector 9 is secured to the element 7, which detector is embodied so as to be suitable for the wireless reception of signals and conversion thereof to electrical signals. In this example, the lid-shaped element 7 is pivoted to the faceplate 3 by means of a flexible hinge 8, which is preferably made of a synthetic resin. The hearing aid further includes an electrical connection means for electrically connecting the detector 9 to said electronic means. This connection means consists of a flexible conductor 23a, 23b which is integrated in the hinge 8.

The hearing aid shown in Fig. 4 comprises a housing 1 having a battery compartment 5. A faceplate 3 with a lid-shaped element 7 which is pivotable about a hinge 18 is situated at a distal end part of the housing 1. The element 7 extends above the compartment 5 and is provided with a detector 9 which is secured to the element 7. The hearing aid further includes an electrical connection means for electrically connecting, in a closed position of the element 7, wherein the compartment 5 is closed, the detector 9 to an electronic circuit accommodated in the housing 1. In this example, the connection means includes a first contact member 33a which is secured to the lid-shaped element 9, and a second contact member 33b which is situated at, in particular in, the housing 1. In the closed position of the element 7, both contacts 33a and 33b lie against each other and hence are in contact with each other. In the open position shown, however, the contact is interrupted.

The in-the-ear hearing aid shown in Fig. 5 comprises a housing 1 and a faceplate 3 with a lid-shaped element 7 which is provided with a radiation-sensitive detector 9. The element 7 is provided with two swivel axles 28, only one of which is shown in the drawing, by means of which the element 7 is pivoted to the faceplate 3. At least one of the swivel axles 28 is provided with an isolated electroconductive ring or ring-shaped layer 33a which is electrically connected, for example by electric wiring 33a1, to the detector 9. A push contact 33b lies against the ring or layer 33a, which push contact is electrically connected, for example by electric wiring 33b1, to an electric or electronic circuit of the hearing aid situated in the housing 1.

It is noted that the invention is not limited to the above examples. Also other embodiments of the inventive hearing aid comprising a detector which is secured to the lid-shaped element fall within the scope of protection of the invention. Examples of such embodiments include not-in-the-ear hearing aids. With respect to the claims, it is noted that various characteristics as defined in the sub-claims may exist in combination with each other.

## CLAIMS:

1. A hearing aid comprising a housing and a faceplate, which housing accommodates an electronic circuit and a battery compartment, said faceplate including a lid-shaped element which can be moved with respect to the battery compartment, said battery compartment being closed in a closed position of the lid-shaped element, and said battery  
5 compartment being accessible in an open position of the lid-shaped element, characterized in that a detector is secured to the lid-shaped element, which detector is embodied so as to be suitable for the wireless reception of signals and conversion thereof to electrical signals, an electrical connection means being present, which connects, at least in the closed state of the lid-shaped element, the detector secured to the lid-shaped element to the electronic circuit.  
10
2. A hearing aid as claimed in claim 1, characterized in that, at least in the closed position of the lid-shaped element, the detector extends opposite the battery compartment.
3. A hearing aid as claimed in claim 1, characterized in that the detector  
15 comprises an infrared radiation-sensitive semi-conducting element.
4. A hearing aid as claimed in claim 3, characterized in that the infrared radiation-sensitive semiconducting element has main dimensions which extend at least substantially parallel to a main surface of the lid-shaped element.  
20
5. A hearing aid as claimed in claim 1, characterized in that the detector extends opposite a part of the lid-shaped element which is transparent to the radiation used.
6. A hearing aid as claimed in claim 1, characterized in that the lid-shaped element  
25 extends over the major part of the faceplate.
7. A hearing aid as claimed in claim 1, characterized in that the lid-shaped element is secured so as to be pivotable relatively to the housing.



8. A hearing aid as claimed in claim 1, characterized by the presence of a flexible hinge for the lid-shaped element, which hinge is provided with an integrated electric conductor which forms part of the electrical connection means.

5 9. A hearing aid as claimed in claim 1, characterized in that the electrical connection means includes a first contact member which is secured to the lid-shaped element, and a second contact member which is situated at the housing, which contact members are in electrical contact with each other, at least in the closed position of the lid-shaped element.

10 10. A system comprising the hearing aid as claimed in any one of the preceding claims, as well as a remote control adapted to said hearing aid.

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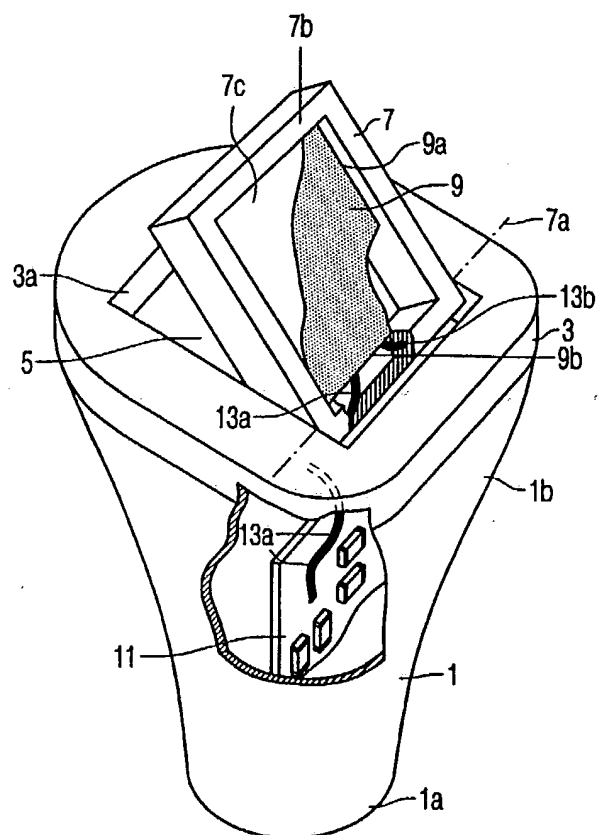


FIG. 1

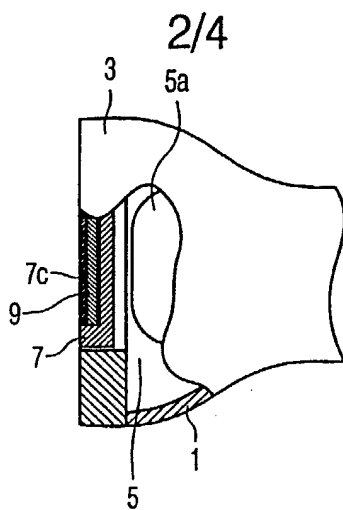


FIG. 2A

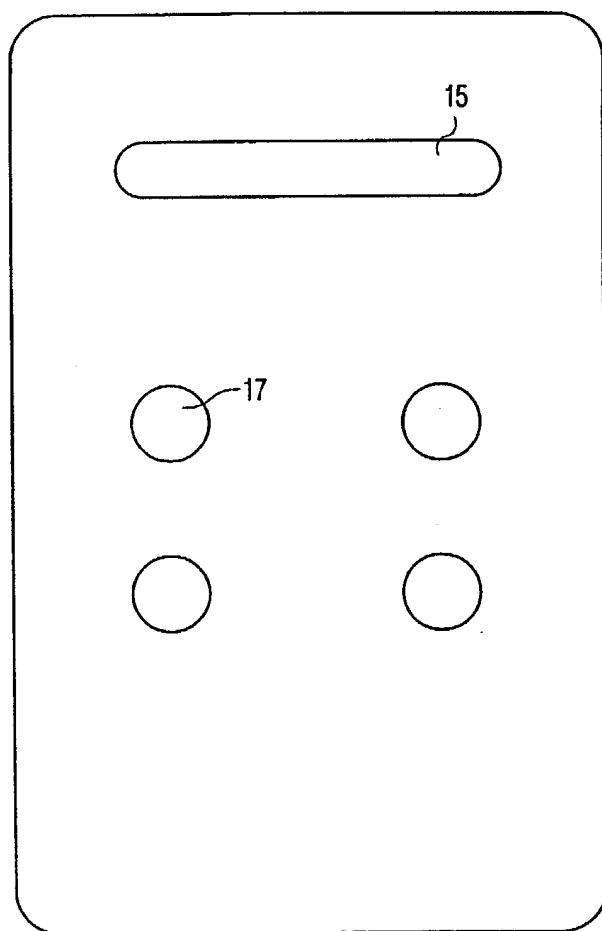


FIG. 2B

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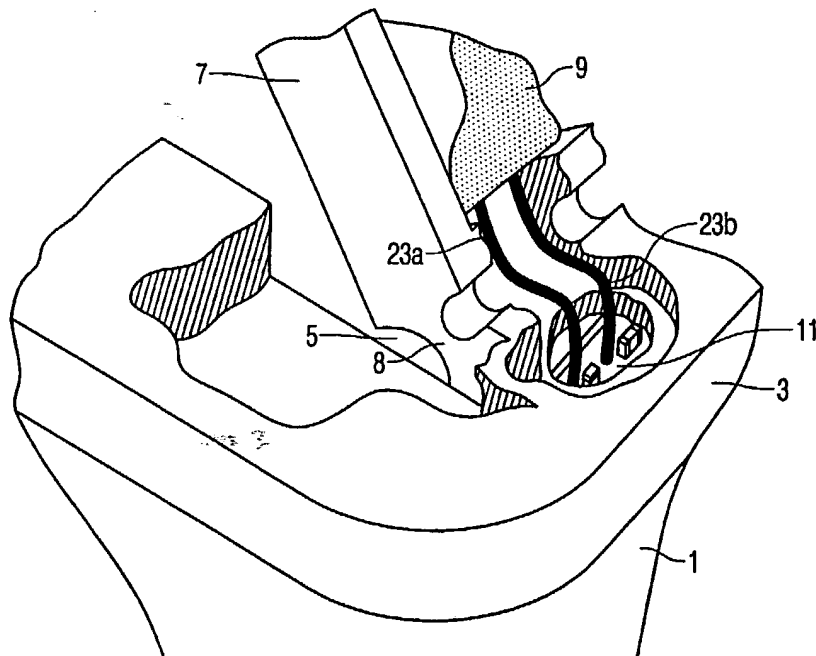


FIG. 3

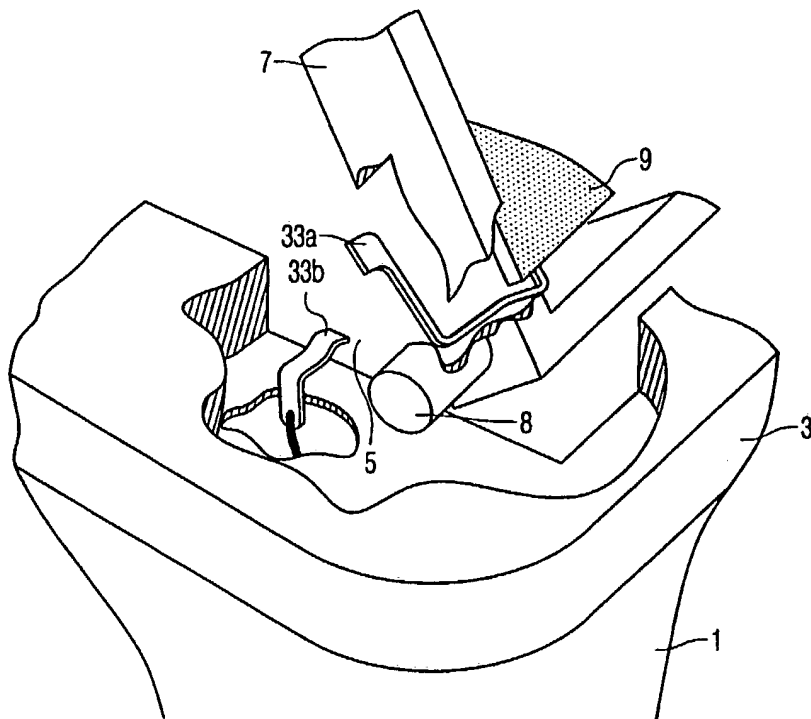


FIG. 4

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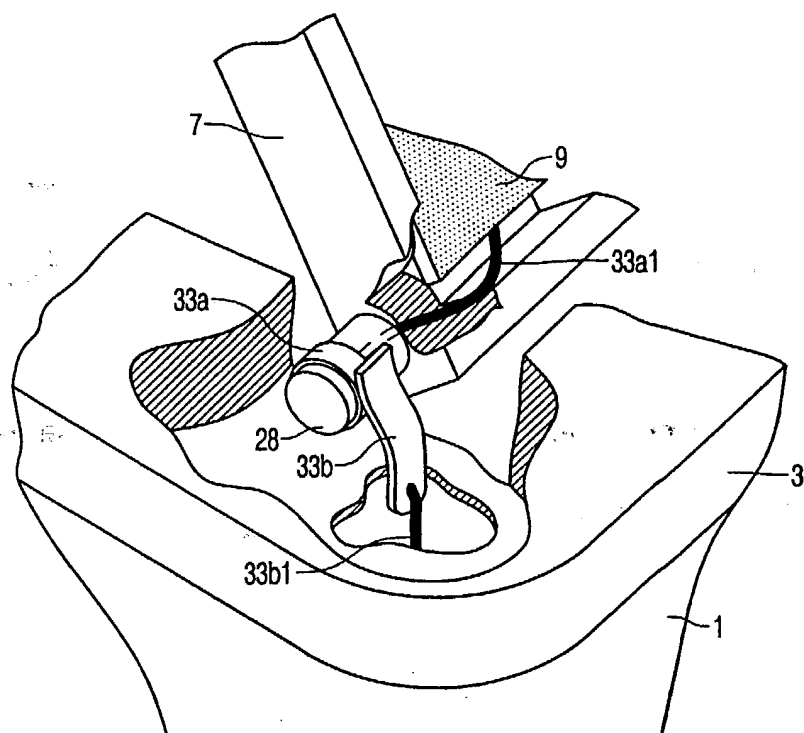


FIG. 5

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 99/00353

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
IPC6: H04R 25/02 // H05K 5/03 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols)		
IPC6: H04R, H05K		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
SE,DK,FI,NO classes as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
EPODOC, WPI, PAJ		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5610988 A (MIYAHARA), 11 March 1997 (11.03.97), column 3, line 22 - line 29; column 3, line 34 - line 40 --	1-6,10
P,A	US 5768397 A (FAZIO), 16 June 1998 (16.06.98), column 2, line 23 - line 27; column 2, line 38 - line 53 --	1-5,10
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<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
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## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

01/06/99

International application No.  
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